



eco-INSTITUT Germany GmbH

Laborprüfung
Laboratory testing

Synwer Group GmbH
Camp-Spich-Straße 69
53842 Troisdorf

Test Report No. 54231-001

Test objective:

Evaluation according to AgBB-scheme 2018

Sample description by client:

Syn 100 Sd 20

tested as a representative for:

USB Micro 100 / 20

USB Micro 230 / 20

Sampled by:

Herr Hagenbäumer, Synwer Group GmbH

Date of sampling:

11.04.2019

Location of sampling:

at the client

Date of production:

08.04.2019

Date of arrival of sample:

18.04.2019

Test period:

18.04.2019 - 18.06.2019

Date of report:

25.06.2019

Number of pages of report:

19

Testing laboratory:

eco-INSTITUT Germany GmbH, Köln
except ‡ subcontracted
outside accreditation

Test objective fulfilled:



Note:

The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report is not permitted to be used in product and company advertising. The report may be published in full as technical documentation on the Internet with the written consent of eco-INSTITUT Germany GmbH. eco-INSTITUT Germany GmbH has recommended that the manufacturer repeats the test after 3 years at the latest. More information at www.eco-institut.de/en/advertising

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Sample View

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A001	Syn 100 Sd 20	without objection	Dampfbremse



A001: Syn 100 Sd 20

Expert Evaluation[#]

As a representative for the products **USB Micro 100 / 20** and **USB Micro 230 / 20**, the product **Syn 100 Sd 20** has been tested on behalf of **Synwer Group GmbH**.

This evaluation is based on the test criteria of the Scheme "Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products" of the Committee for Health-Related Evaluation of Building Products (AgBB 2018).

The results documented in the test report were evaluated as follows.

Test parameter	Result	Requirement	Requirement hold [yes/no]
Emission analysis			
Measurement time: 3 days after test chamber loading			
Sum VOC (C6-C16) including SVOC with LCI ¹⁾	0,13 mg/m ³	≤ 10 mg/m ³	yes
Sum carcinogenic substances (EU cat. 1A and 1B)	< 0,001 mg/m ³	≤ 0,01 mg/m ³	yes
Measurement time: 28 days after test chamber loading			
Sum VOC (C6-C16) including SVOC with LCI ¹⁾	0,012 mg/m ³	≤ 1 mg/m ³	yes
Sum SVOC without LCI (C ₁₆ -C ₂₂) ¹⁾	0,024 mg/m ³	≤ 0,1 mg/m ³	yes
R-Wert (dimensionless)	0,01	≤ 1	yes
Sum VOC without LCI	< 0,005 mg/m ³	≤ 0,1 mg/m ³	yes
Sum carcinogenic substances (EU cat. 1A and 1B)	< 0,001 mg/m ³	≤ 0,001 mg/m ³	yes

1) for Sum VOC (C6-C16) and Sum SVOC (C16-C22) only substances ≥ 5 µg/m³ are considered

Summary evaluation[#]

The product **Syn 100 Sd 20** meets the emission requirements of the AgBB-Scheme.

Cologne, 25.06.2019

A handwritten signature in black ink, reading "M.-A. Dobaj". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Project Manager)

Laboratory report

1 Emission analysis

Test method

DIN EN 16516

Testing and evaluation of the release of dangerous substances;
determination of emissions into indoor air

A001, Preparation of test sample

Date:

Pre-treatment:

not applicable;

Masking of backside:

yes

Masking of edges:

no

Relationship of unmasked
edges to surface:

not applicable

Loading:

related to area

Dimensions:

35,3 cm x 35,3 cm

A001, Test chamber conditions according to DIN ISO 16000-9

Chamber volume:

0.125 m³

Temperature:

23°C ± 1°C

Relative humidity:

50 % ± 1 %

Air pressure:

normal

Air:

cleaned

Air change rate:

0.5 h⁻¹

Air velocity:

0,3 m/s

Loading:

1 m²/m³

Specific air flow rate:

0.5 m³/(m² · h)

Air sampling:

3 days after test chamber loading

28 days after test chamber loading

Analytics

Aldehydes and Ketones

DIN ISO 16000-3

Limit of determination:

2 µg/m³

Volatile Organic Compounds

DIN ISO 16000-6

Limit of determination:

1 µg/m³ (1,4-Cyclohexanedimethanol, Diethylene glycol,
1,4-Butanediol, Linalyl acetate: 5 µg/m³)

Note for analysis:

not specified

Sample A001, Volatile Organic Compounds after 3 days

Test objective:

Volatile Organic Compounds (VOC), test chamber, air sampling 3 days after test chamber loading

Test result:

Sample: A001: Syn 100 Sd 20

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene- equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi- cation++	LCI AgBB 2018 [µg/m³]	R-value
2	Aliphatic hydrocarbons (n-, iso- and cyclo-)							
2-10.3	n-Undecane	1120-21-4	15,51	1			6000	0,00
2-10.4	n-Dodecane	112-40-3	17,57	5			6000	0,00
2-10.5	n-Tridecane	629-50-5	20,02	5			6000	0,00
6	Glycols, Glycol ethers, Glycol esters							
6-11	Diethylene glycol monomethyl ether acetate (2-(2-Butoxyethoxy) ethyl acetate) (BDGA)	124-17-4	21,23	1			850	0,00
7	Aldehyde							
7-7	Nonanal	124-19-6	15,64	2			900	0,00
8	Ketones							
8-10	Acetone	67-64-1		3			1200	0,00
9	Acids							
9-1	Acetic acid	64-19-7	4,79	2			1200	0,00
13	Other identified substances in addition to LCI list							
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8,89	2				
	m/z 43 69 97*		15,80	1				
	Multiple ester*		16,7-17,2	6	6			
	Ester, presumably acrylate*		17,57	16	16			
	m/z 55 69 84*		18,26	4				
	different Ester Acrylates*		18,37-19,08	56	56			

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene- equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi- cation++	LCI AgBB 2018 [µg/m³]	R-value
	several not identified substances*		20,06- 20,6	14	14			
	m/z 129 207 91*		26,99	8	8			
	m/z 221 143 91*		27,22	24	24			
	m/z 55 82 111*		27,73	2				
	m/z 119 91 41*		28,12	3				
	m/z 143 91 221*		28,57	4				

+ identified and calibrated substances, substance specific calculated

++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A, DFG MAK-list: Kategorie III1 and III2

* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 0,5
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 0,5

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN EN 16516	120	61
Sum of VOC according to AgBB 2018 / DIBt	130	66
Sum of VOC according to eco-INSTITUT-Label	150	77
Sum of VOC according to ISO 16000-6	220	110

TSVOC, Total semi volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	32	16
Sum of SVOC without LCI according to AgBB 2018 / DIBt	32	16
Sum of SVOC without LCI according to eco-INSTITUT-Label	37	19
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 2,5

TVVOC, Total very volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 2,5
Sum of VVOC according to eco-INSTITUT-Label	3	1,5

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary.

In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	98	49
VOC without LCI according to eco-INSTITUT-Label (Sum)	110	53
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	< 1	< 0,5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1	< 0,5
Bicyclic Terpenes (sum)	< 1	< 0,5
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	11	5,5
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	2	1
C9 - C15 Alkylated benzenes (Sum)	< 1	< 0,5
Cresols (Sum)	< 1	< 0,5

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0,01
R-value according to AgBB 2018 / DIBt	0,00
R-value according to Belgian regulation	0,00
R-value according to AFSSET	0,00

Note:

Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.

For short-chain carbonyl compounds (C₁-C₅), which are quantified by HPLC according to DIN ISO 16000-3, no indication of the toluene equivalent is specified. Therefore, these substances are considered with their substance-specific Quantification in the TVVOC acc. DIN EN 16516.

Sample A001, Volatile Organic Compounds after 28 days

Test objective:

Volatile Organic Compounds (VOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample:

A001: Syn 100 Sd 20

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene- equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi- cation++	LCI AgBB 2018 [µg/m³]	R-value
6	Glycols, Glycol ethers, Glycol esters							
6-11	Diethylene glycol monomethyl ether acetate (2-(2-Butoxyethoxy) ethyl acetate) (BDGA)	124-17-4	21,18	1			850	0,00
8	Ketones							
8-10	Acetone	67-64-1		3			1200	0,00
9	Acids							
9-1	Acetic acid	64-19-7	4,85	12			1200	0,01
13	Other identified substances in addition to LCI list							
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8,87	3				
	Cluster isoalkanes, alkenes and/or other alcohols*		14,09	2				
	different Ester Acrylates*		18,37-19,08	3				
	several not identified substances*		20,06-20,6	2				
	m/z 129 207 91*		26,99	6	6			
	m/z 221 143 91*		27,22	18	18			
	m/z 55 82 111*		27,73	2				
	m/z 119 91 41*		28,12	3				
	m/z 143 91 221*		28,57	4				

+ identified and calibrated substances, substance specific calculated

++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A, DFG MAK-list: Kategorie III1 and III2

* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 0,5
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 0,5

TVOC, Total volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN EN 16516	< 5	< 2,5
Sum of VOC according to AgBB 2018 / DIBt	12	6
Sum of VOC according to eco-INSTITUT-Label	23	12
Sum of VOC according to ISO 16000-6	27	14

TSVOC, Total semi volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	24	12
Sum of SVOC without LCI according to AgBB 2018 / DIBt	24	12
Sum of SVOC without LCI according to eco-INSTITUT-Label	29	15
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 2,5

TVVOC, Total very volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 2,5
Sum of VVOC according to eco-INSTITUT-Label	3	1,5

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary.

In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	< 5	< 2,5
VOC without LCI according to eco-INSTITUT-Label (Sum)	10	5
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	< 1	< 0,5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1	< 0,5
Bicyclic Terpenes (Sum)	< 1	< 0,5
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 0,5
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 1
C9 - C15 Alkylated benzenes (Sum)	< 1	< 0,5
Cresols (Sum)	< 1	< 0,5

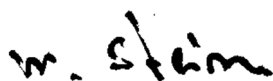
Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0,01
R-value according to AgBB 2018 / DIBt	0,01
R-value according to Belgian regulation	0,01
R-value according to AFSSET	0,05

Note:

Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.

For short-chain carbonyl compounds (C₁-C₅), which are quantified by HPLC according to DIN ISO 16000-3, no indication of the toluene equivalent is specified. Therefore, these substances are considered with their substance-specific Quantification in the TVVOC acc. DIN EN 16516.

Cologne, 25.06.2019



Michael Stein, Dipl.-Chem.
(Laboratory Manager)

Remark: It is not permitted to publish extracts of this report and the comments on the first page of this report apply.

Appendix

I Sampling sheet

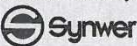
Produktprüfung Product testing
Zertifizierung Certification
Beratung Consulting

eco
INSTITUT

Probenahmebegleitblatt*

Projektnummer
eco-INSTITUT /
wird vom Labor
ausgefüllt

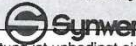
54231-001

Prüflabor	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Köln Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	Probenehmer (Name, Firma, Telefon)	Hr. Hagenbäum Synwer Group GmbH 02241-397-990-21
Name des Herstellers/ Händlers am Probenahmeort (Adresse / Stempel)	Synwer Group GmbH Mülheimer Str. 27 - 53840 Troisdorf 02241-397990-0 - Fax 02241-397990-90 info@synwer.com - www.synwer.com 	Auftraggeber/ Rechnungsempfänger (falls abweichend vom Herstellernamen)	

Produktname	Syn 100 Sd 20	Probeart (z.B. Holzwerkstoff, Bodenbelag)	Dampfbremse
Modell / Pro- gramm/ Serie	FA-16751	Chargen-Nr.	FA-16751
Artikel-Nr.	1585	Produktionsda- tum der Charge	08.04.2019

Probe wird gezogen ...	aus der laufenden Produktion aus Lagerbeständen	Datum der Probenahme	11.04.2019
Wo wurde das Produkt vor Probenahme gelagert?	Fertigung Lager Sonstiges Lagerort: Fertigung	Uhrzeit	14 ¹⁵ Uhr
		Wie wurde das Produkt vor Probenahme gelagert?	offen ☒ verpackt
		Verpackungsmaterial:	

Besonderheiten (mögliche negative Einflüsse durch Emissionen am Probenahmeort (z.B. Benzin-Abgase, Lösemittlemissionen aus der Fertigung), Unklarheiten, Fragen, etc.)	Abgase Stapler
--	----------------

Bestätigung Hiermit bestätigt der Unterzeichner die Richtigkeit der oben gemachten Angaben. Die Probe wurde eigenhändig gemäß Probenahmeanleitung ausgewählt, gezogen und verpackt.	Synwer Group GmbH Mülheimer Str. 27 - 53840 Troisdorf Tel. 02241-397990-0 - Fax 02241-397990-90 info@synwer.com - www.synwer.com 
Datum:	Unterschrift: (Stempel)
12.04.19	Hagenbäum

* Bitte pro Probe ein Probenahmebegleitblatt ausfüllen! Die Probenahmeanleitung ist unbedingt einzuhalten!

Beauftragung (Bitte Angebotsnummer eintragen bzw. falls nicht vorhanden, Untersuchungsziel angeben)	02085
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HRB 17917 / USt-ID: DE 122653308 / Raiffeisenbank Frechen-Hürth, IBAN: DE60370623651701900010, BIC: GENODE33HAN

HRB 17917 (02.05.17) 17025 akkreditiertes Institut

Deutsche
akkreditierungsstelle
D-PL-20051-01-00

II Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 (n-Hexane) to C_{16} (n-Hexadecane)
TVOC	Total volatile organic compounds
TVOC according to DIN EN 16516	Sum of all VOC $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16} , calculated as toluene equivalent
TVOC according to AgBB/DIBt	Sum of all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to ISO 16000-6	Total area of chromatogram in the retention range C_6 to C_{16} , calculated as toluene equivalent
TVOC without LCI according to AgBB/DIBt and Belgian regulation	Sum of all VOC without NIK $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
TVOC without LCI according to eco-INSTITUT-Label	Sum of all VOC without NIK $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
CMR-VOC (carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC)	All individual substances with the following categories: Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B IARC: Group 1 and 2A DFG (MAK lists): Category III1 and III2
VVOC (very volatile organic compounds)	All individual substances with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range $< C_6$
TVVOC	Total very volatile organic compounds
TVVOC according to AgBB/DIBt and Belgian regulation	Sum of all identified and calibrated VVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
TVVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI
SVOC (semi volatile organic compounds)	All individual substances $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_{16} to C_{22}
TSVOC	Total semi volatile organic compounds
TSVOC according to DIN EN 16516	Sum of all SVOC in the retention range C_{16} to C_{22} , calculated as toluene equivalent
TSVOC without LCI according to AgBB/DIBt	Sum of all SVOC $\geq 5 \mu\text{g}/\text{m}^3$ without LCI
TSVOC without LCI according to eco-INSTITUT-Label	Sum of all SVOC $\geq 1 \mu\text{g}/\text{m}^3$ without LCI
TSVOC with LCI according to AgBB/DIBt	Sum of all identified and calibrated SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
SER	Specific emission rate (see appendix IV)

LCI value	Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB)
R value	The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air. The sum of the calculated quotients results in the R value.
R value according to eco-INSTITUT-Label	R value for all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to AgBB 2018/DIBt	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to Belgian regulation	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by ANSES (French National Agency on Food Safety, Environment, and Workplace Security)
RT (retention time)	Time for a particular analyte to pass through the system (from the column inlet to the detector)
CAS No. (Chemical Abstracts Service)	International unique numerical identifier for a chemical substance
Toluene equivalent	Concentration, calculated as toluene equivalent

III List of calibrated Volatile Organic Compounds (VOC)

Aromatic hydrocarbons

Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
Isopropylbenzene
n-Propylbenzene
1,3,5-Trimethylbenzene
1,2,4-Trimethylbenzene
1,2,3-Trimethylbenzene
2-Ethyltoluene
1-Isopropyl-2-methylbenzene
1-Isopropyl-4-methylbenzene
1,2,4,5-Tetramethylbenzene
n-Butylbenzene
1,3-Diisopropylbenzene
1,4-Diisopropylbenzene
Phenyltoluene
1-Phenyldecane²
1-Phenylundecane²
4-Phenylcyclohexene
Styrene
β-Methylstyrene
Phenylacetylene
2-Phenylpropene
Vinyltoluene
Naphthalene
Indene
Benzene
1-Methylnaphthalene
2-Methylnaphthalene
1,4-Dimethylnaphthalene

Saturated aliphatic substances

2-Methylpentane¹
3-Methylpentane¹
n-Hexane
Cyclohexane
Methylcyclohexane
n-Heptane
n-Octane
n-Nonane
n-Decane
n-Undecane
n-Dodecane
n-Tridecane
n-Tetradecane
n-Pentadecane
n-Hexadecane
Methylcyclopentane
1,4-Dimethylcyclohexane
2,2,4,6,6-Pentamethylheptane

Terpenes

δ-3-Carene
α-Pinene
β-Pinene
Limonene
Longifolene

β-Caryophyllene
α-Phellandrene
Myrcene
Camphene
α-Terpinene
Longipinene
trans-β-Farnesene
cis-β-Farnesene
Isolongifolene

Aliphatic alcohols and ether

1-Propanol¹
2-Propanol¹
1-Butanol
1-Pentanol
1-Hexanol
tert-Butanol
Cyclohexanol
2-Ethyl-1-hexanol
2-Methyl-1-propanol
1-Octanol
4-Hydroxy-4-methyl-2-pentanone
1-Heptanol
1-Nonanol
1-Decanol
1,4-Cyclohexandimethanol

Aromatic alcohols (phenoles)

Phenol
BHT (2,6-Di-tert-butyl-4-methylphenol)
Benzyl alcohol
Cresols

Glycols, Glycol ether, Glycol ester

Propylenglycol (1,2-Dihydroxypropane)
Ethleneglycol (Ethandiol)
Ethylene glycol monobutyl ether
Diethylene glycol
Diethylene glycol-monobutyl ether
2-Phenoxyethanol
Ethylene carbonate
1-Methoxy-2-propanol
2-Methoxy-1-propanol
2-Methoxy-1-propyl acetate
Texanol
Glycolic acid butylester
Butyl diglycol acetate
Dipropylene glycol monomethyl ether
2-Methoxyethanol
2-Ethoxyethanol
2-Propoxyethanol
2-Methylethoxyethanol
2-Hexoxyethanol
1,2-Dimethoxyethane
1,2-Diethoxyethane
2-Methoxyethyl acetate
2-Ethoxyethyl acetate
2-(2-Hexoxyethoxy)ethanol
1-Methoxy-2-(2-methoxy-ethoxy)ethane
Propylene glycol diacetate

Dipropylene glycol monomethylether acetate
Dipropylene glycol n-butylether
Dipropylene glycol n-propyl ether
Di(propylene glycol) tert-butylether
1,4-Butanediol
Tri(propylene glycol) methyl ether
Triethylene glycol dimethyl ether
Propylene glycol dimethyl ether
TXIB (Texanol isobutyrate)
Ethylidiglycol
Dipropylene glycol dimethylether
Propylene carbonate
Hexleneglycol
3-Methoxy-1-butanol
Propylene glycol n-propyl ether
Propylene glycol n-butyl ether
Diethylene glycol phenyl ether
Neopentyl glycol
Diethylene glycol methyl ether
1-Ethoxy-2-propanol
tert-Butoxy-2-propanol
2-Butoxy ethyl acetate

Aldehydes

Butanal^{1,3}
3-Methyl-1-butanol
Pentanal³
Hexanal
Heptanal
2-Ethylhexanal
Octanal
Nonanal
Decanal
2-Butenal³
2-Pentenal³
2-Hexenal
2-Heptenal
2-Octenal
2-Nonenal
2-Decenal
2-Undecenal
Furfural
Ethanedial (Glyoxal)^{1,3}
Glutaraldehyde
Benzaldehyde
Acetaldehyde^{1,3}
Formaldehyde^{1,3}
Propanal^{1,3}
Propenal^{1,3}
Isobutenal³

Ketones

Ethylmethylketone³
3-Methyl-2-butanone
Methylisobutylketone
Cyclopentanone
Cyclohexanone
Acetone^{1,3}
2-Methylcyclopentanone
2-Methylcyclohexanone

	Dipropylene glycol	Acetophenone
1-Hydroxyacetone	Glutaric acid dimethylester	Decamethylcyclopentasiloxane
2-Heptanon	Hexandioldiacrylate	Dodecamethylcyclohexasiloxane
Acids	Maleic acid dibutylester	Tetrahydrofuran (THF)
Acetic acid	Butyrolactone	1-Decene
Propionic acid	Glutaric acid diisobutylester	Benzothiazole
Isobutyric acid	Succinic acid diisobutylester	1-Octene
Butyric acid	Dimethylphthalate	2-Pentylfuran
Pivalic acid	Diethylphthalate ²	2-Methylfuran
Valeric acid	Dipropylphthalate ²	Isophorone
Caproic acid	Dibutylphthalate ²	Tetramethyl succinonitrile
Heptanoic acid	Diisobutylphthalate ²	Dimethylformamide (DMF)
Octanoic acid	Dipropylene glycol diacrylate	Tributyl phosphate
2-Ethylhexanoic acid		N-Ethyl-2-pyrrolidone
Esters and Lactones	Chlorinated hydrocarbons	Aniline
Methylacetate ¹	Tetrachlorethene	4-Vinylcyclohexene
Ethyl acetate ¹	1,1,1-Trichlorethane	Dichloromethane
Vinyl acetate ¹	Trichlorethene	Carbon tetrachloride
Isopropyl acetate	1,4-Dichlorobenzene	Chloroform
Propyl acetate	Chlorobenzene	Chloroprene (monomer)
2-Methoxy-1-methylethyl acetate		Acetamide
n-Butyl formate	Others	Formamide
Methylmethacrylate	1,4-Dioxane	1,3-Dichlor-2-propanol
Isobutylacetate	Caprolactam	2-n-Octyl-4-isothiazolin-3-one (OIT)
1-Butyl acetate	N-Methyl-2-pyrrolidone	Cyclohexylisocyanate
2-Ethylhexyl acetate	Octamethylcyclotetrasiloxane	Butyl methacrylate
Methyl acrylate	Hexamethylcyclotrisiloxane	2-Hexanone
Ethyl acrylate	Methenamine	Azobis[isobutyronitrile]
n-Butyl acrylate	2-Butanonoxime	
2-Ethylhexyl acrylate	Triethyl phosphate	
Adipic acid dimethylester	Tributyl phosphate	
Fumaric acid dibutylester	5-Chlor-2-methyl-4-isothiazolin-3-one (CIT)	
Succinic acid dimethylester	2-Methyl-4-isothiazolin-3-one (MIT)	
	Triethylamine	

- 1 VVOC
- 2 SVOC
- 3 Analysis according to DIN ISO 16000-3

IV Commentary on emission analysis

Test method

Measurement of the volatile organic compounds takes place in the test chamber in conditions similar to those applying in practice. Standardized test conditions are defined for the test chamber regarding loading, air exchange, relative humidity, temperature and incoming air, based on the type of test specimen and the required guideline. These conditions and the underlying standards are to be found in the section on test methods in the laboratory report.

Air samples are taken from the test chamber at defined points in time during the continuously running test. To this end, approximately 5 L of air are collected from the test chamber with an air flow rate of 100 mL/min for Tenax and approx. 100 L with an air flow rate of 0.8 L/min for DNPH (dinitrophenylhydrazine).

After thermal desorption, the substances adsorbed on Tenax are analysed using gas chromatographic separation and mass spectrometric determination. The gas chromatographic separation is performed with a slightly polar capillary column of 60 m in length.

The substances derivatized with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed using high-performance liquid chromatography.

Over 200 compounds, including volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – insofar as possible with this method – also very volatile organic compounds (less than C6) are determined and quantified individually.

All other substances – insofar as is possible – are identified through comparison with a library of spectra. The quantification of these substances and non-identified substances is performed through a comparison of their signal area with the signal of the internal standard d8 toluene. As far as possible, identification and quantification limit of any substance shall be 1 µg per m³ for substances adsorbed on Tenax and 2 µg/m³ for DNPH-derivatized substances (limit of quantification).

Quality assurance

The eco-INSTITUT Germany GmbH is granted flexible scope of accreditation pursuant to DIN EN ISO/IEC 17025. The accreditation covers the analytical determination of all volatile organic compounds, including the test chamber method.

In each analysis the analytical system is checked using an external standard based on the specifications in standard DIN EN 16516. The stability of the analytical systems is documented based on the test standard using control charts.

Laboratory performance is assessed at least once a year in inter-laboratory comparisons by comparing the results with those obtained by other laboratories for identical samples.

A blank is run prior to introducing the test specimen into the test chamber to check for the possible presence of volatile organic compounds.

V Explanation of Specific Emission Rate SER

Emission measurements are accomplished in test chambers under defined physical conditions (temperature, relative humidity, room loading, air change rate etc.).

Test chamber measurement results are directly comparable only if the investigations were accomplished under the same basic conditions.

If the differences of the physical conditions refer only to the change of air rate and/or the loading, the "SER" or "specific emission rate" can be used for comparability of the measurement results. The SER indicates how many volatile organic compounds (VOC) are released by the sample for each material unit and hour (h).

The SER can be calculated using the formula below for each proven individual component of the VOC from the data in the test report.

As material units the following are applicable:

l = unit of length (m)	relation between emission and length
a = unit area (m ²)	relation between emission and surface
v = unit volume (m ³)	relation between emission and volume
u = piece unit (unit = piece)	relation between emission and complete unit

From this the different dimensions for SER result:

length-specific	SER _l	in µg/(m·h)
surface-specific	SER _a	in µg/(m ² ·h)
volume-specific	SER _v	in µg/(m ³ ·h)
unit specific	SER _u	in µg/(u·h)

SER thus represents a product specific rate, which describes the mass of the volatile organic compound, which is emitted by the product per time unit at a certain time after beginning of the examination.

$$\text{SER} = q \cdot c$$

q	specific air flow rate (quotient from change of air rate and loading)
c	concentration of the measured substance(s)

The result can be indicated in milligrams (mg) in place of micro grams (µg), whereby 1 mg = 1000 µg.